# Using heat to estimate streambed seepage along the lower Boise River, Idaho

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A 2001 synoptic study of the lower Boise River estimated that as much as 150 pounds per day of dissolved phosphorus from ground-water seepage was entering a three-mile reach of the Boise River. Results of the synoptic study indicate the potential of significant seepage of nutrients to the lower Boise River from ground water. A more focused study of ground-water and surface-water interaction was designed and implemented in 2003 to identify seepage between ground water and the lower Boise River streambed.

Heat has long been identified as a potential tracer of water exchange between streams and shallow ground-water systems. Recent advances in data-acquisition and computation have enabled the economic and routine application of heat as a hydrologic tracer. Using the USGS model, VS2DH, temperature data will be used to simulate the transport of heat through ground water at four transects along a three-mile reach of the lower Boise River.

Up to seven piezometers were installed and surveyed at each of four transects along the lower Boise River near Parma. One piezometer was installed in the center of the stream, one near each bank, one on each bank, and a piezometer installed short distance from each side of the stream. The near bank piezometers had two continuous recording temperature thermistors installed at different locations within the piezometer and one thermistor located on the outside of the piezometer. Water levels were measured monthly in all of the piezometers. Nutrients and water-quality parameters were measured in the near-bank piezometers in May, July, and August. Slug tests were also conducted in the near-bank piezometers to determine hydraulic conductivity, a parameter required for the VS2DH model.

The above data will be used with VS2DH to estimate the seepage to and from the lower Boise River during the summer of 2003. The seepage estimates can then potentially be used to help determine the approximate amount of nutrients being transported to or from the stream.